Prudence, Scope for Discretionary Measures and Policy Rules in Medium-Term Fiscal Planning

by

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-Abstract-

This paper shows that managing the risk of a budget deficit has (at least) two elements, the level of fiscal prudence, and the scope for discretionary measures (*e.g.*, scope for reducing program spending). These two elements *jointly* determine the probability of a deficit outcome. The magnitude of the scope is limited by a multi-year pre-commitment to a minimum level (a "floor") of fiscal measures (program spending and taxes) that is "irreversible" or permanent for the purpose of medium-term fiscal planning.

The policy implications of the paper are twofold. First, one has to know how much scope is available for reducing program spending in order to provide estimates of "adequate" levels for fiscal prudence. There is, however, little consensus about how much scope is available. Second, the timing and magnitude of the enrichments of permanent tax and spending measures should be linked to the occurrence of favourable fiscal developments that raise the scope for discretionary measures. This strategy would enhance the fiscal authority's pre-commitment to permanent measures without substantially increasing the risk of a deficit outcome.

-Résumé-

Ce papier montre que la gestion du risque d'un déficit budgétaire comporte (au moins) deux éléments: le niveau de prudence fiscale et la marge de manœuvre disponible pour des mesures budgétaires discrétionnaires (*e.g.*, potentiel de réduction des dépenses de programmes). Ces deux éléments déterminent conjointement la probabilité d'observer un déficit budgétaire. Le potentiel de réduction des dépenses de programmes est limité par un engagement à un niveau minimum (« plancher») de dépense de programme au cours d'un horizon temporel à moyen terme (10 ans). Cet engagement est, par définition, irrévocable, ce qui permet d'assurer un niveau minimum de dépenses permanentes au cours de l'horizon temporel considéré.

Deux principales implications politiques découlent de ce papier. Premièrement, il est important de connaître la marge de manœuvre disponible pour des mesures budgétaires discrétionnaires de façon à allouer un niveau adéquat de prudence budgétaire. Cependant, il n'existe pas de consensus concernant cette marge de manœuvre discrétionnaire (en particulier le potentiel de réduction des dépenses). Deuxièmement, le moment (ou « timing ») et la taille des enrichissements des mesures permanentes de dépenses (ou de taxations) devraient être associés à la présence de développements budgétaires augmentant la marge de manœuvre discrétionnaire. Cette stratégie permettrait d'améliorer la mise en œuvre de mesures budgétaires permanentes sans toutefois faire augmenter de façon substantielle le risque d'observer un déficit budgétaire.

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Introduction

This paper evaluates the degree of fiscal prudence required to insure against a deficit with a given level of probability. We do this in the context of a fiscal policy rule that targets a level for the budget surplus and adjusts (increase/reduce) program spending temporarily to respond to observed deviations from this target. In this setting, the fiscal authority has some scope to reduce program spending if needed. The scope is an important element of an integrated strategy for deficit-risk management, although it has been neglected by some studies [*e.g.*, Hermanutz and Matier (2000)].

The paper innovates by establishing a multi-year pre-commitment to a minimum level (a "floor") of program spending that is "irreversible" or "permanent" for the purpose of medium-term fiscal planning. This limits the magnitude of the scope for reducing program spending when economic developments turn out to be substantially weaker than expected. This leads to the idea that the fiscal authority, in its budget plans, does not attempt to target a surplus at all cost, such as by rolling back new health-care transfers to the provinces or deferring pre-committed tax cuts. The floor effectively decomposes program spending into transitory (discretionary) and permanent (non-discretionary) components.

Our paper shows that we can economize on the amount of fiscal prudence, but still insure against the same risk of deficit (*i.e.*, avoiding a deficit outcome with the same level of probability) if the fiscal authority has some scope for reducing program spending. Hence, the paper shows that the fiscal authority has the ability to trade-off prudence with scope to reduce program spending. Our paper, however, does not attempt to answer the question of the optimal combination of prudence and scope. This choice is intricately linked to the desired speed of debt reduction, which affects inter-temporal allocations of spending and taxes. The paper does not address this issue.

Our paper also innovates by developing rules that enrich the multi-year pre-commitment for permanent program spending and taxes. We show that the timing and magnitude of the enrichments should be linked to the occurrence of favourable fiscal developments that raise the scope for making discretionary changes. This strategy would enhance the fiscal authority's pre-commitment to permanent measures without increasing the risk of a deficit outcome. Many studies do not make a distinction between transitory and permanent fiscal developments. For example, fiscal measures are entirely permanent in Hermanutz and Matier (2000), while there are entirely temporary in Hostland and Matier (2001). By addressing both transitory and permanent developments, we believe that our model adds realism to the existing literature and leads to a well-grounded strategy for deficit risk management.

To reiterate, the main conclusion of the paper is that managing the risk of deficit has (at least) two elements, the level of fiscal prudence, and the scope for reducing program spending. These two elements *jointly* determine the probability of a deficit outcome. The scope itself is constraint by the level of the multi-year pre-commitment to permanent tax and spending measures. The policy implications of the paper are twofold. First, one

has to know how much scope is available for reducing program spending in order to provide estimates of "adequate" levels for fiscal prudence. There is, however, little consensus about how much scope is available. Second, avoiding an increase in the risk of a deficit outcome requires linking enrichments of permanent fiscal measures to the occurrence of favourable economic developments that raise the scope for discretionary measures.

The structure of our paper is as follows. Section 1 sets the overall context of our study by reviewing recent studies that have used stochastic simulation models in analysing issues related to fiscal planning. Section 2 highlights the interaction between fiscal prudence, policy rules and the probability of deficit in the context of an unlimited scope to reduce program spending. Section 3 introduces the constrained version of the model where the fiscal authority pre-commits to a multi-year level (a "floor") of program spending that is "irreversible" or "permanent" for the purpose of medium-term fiscal planning. This section also discusses strategies for enriching this pre-commitment. Finally, Section 4 provides a summary of our main results and suggests possible extensions.

1. Selected studies and overall context

This section sets the overall context of our study by reviewing recent studies that have used stochastic simulation methods to analyse issues related to medium-term fiscal planning.

Stochastic simulation models go beyond providing point estimates of relevant variables (budget balances, debt-to-GDP ratios, etc.) by capturing the uncertainty inherent in the economy. Repeated stochastic simulations of the same planning horizon generate a large number of realisations that permit the construction of confidence intervals, or a range of possible outcomes along with corresponding probabilities. For example, by providing a confidence interval on the budget balance, this methodology permits the calculation of the risk, or probability, of having a deficit in any year of the planning horizon. Hostland (2001) describes in depth the Stochastic Simulation Model (SSM) of the Canadian Economy, developed in the Department of Finance, that we have used for our study.

To understand how the existing research fits together, we highlight four aspects or criteria of fiscal planning as shown in the first row of Table 1 and discuss how these aspects are treated in five studies (including ours) listed in the first column of the Table. Each of these four aspects will be briefly discussed in this section, and in further detail in the context of our own study in subsequent sections.

The first aspect of fiscal planning that we want to discuss is the main fiscal goal explored in these papers (second column in Table 1). Although several objectives are usually considered within each paper, studies by Georges (2001) and Hostland and Matier (2001) focus on debt, whereas the other three papers emphasise deficit/surplus outcomes. The papers by Boothe and Reid (1998), Hermanutz and Matier (2000) and our study, are mainly concerned with avoiding a budget deficit outcome and they all evaluate the degree of fiscal prudence required to ensure against a deficit with a given level of probability;

thus all three papers propose a strategy for deficit risk management. For ease of exposure we will focus on these three papers that emphasize the deficit risk management aspect, relegating most of the discussion of the other two studies in Box 1.

Table 1. Aspects of fiscal planning and selected studies

Criteria / Studies	Fiscal goal	Fiscal policy rules (or policy responses to shocks) implementing transitory changes in program spending or tax	Magnitude of scope for reducing program spending	Fiscal policy rules (or policy responses to shocks) implementing permanent fiscal measures
Georges (2001)	Debt-to-GDP ceiling targeting	Asymmetric debt rule	Unlimited	None
Hostland and Matier (2001)	Debt-to-GDP range targeting	Symmetric debt vs. Symmetric surplus rules	Unlimited	None
Boothe and Reid (1998)	Deficit Risk Management	Symmetric surplus rules	Unlimited	None
Hermanutz and Matier (2000)	Deficit Risk Management	None	Zero	"Once and for all" vs. conditional rules
Georges and Moreau	Deficit Risk Management	From symmetric to asymmetric surplus rules	From unlimited to zero	"Once and for all" vs. conditional rules

Four of the five studies consider a variety of fiscal policy rules or policy responses to shocks (Column 3 in Table 1) that would be useful to the fiscal authority to help achieve their fiscal goal (the debt-to-GDP or surplus/deficit targets). These rules are strategies that allow temporary (discretionary) adjustments in program spending or tax in order to achieve the goal of the fiscal authority. They are referred to as debt (stock) or surplus/deficit (flow) target rules, depending on whether fiscal authorities respond to deviations from a desired (or target) debt-to-GDP ratio or a desired surplus/deficit. Although the "instrument" of adjustment could either be program spending or taxes, all papers that envisage such a policy rule in Table 1 effectively consider program spending as the adjusting variable.

Both Boothe and Reid and our study examine a policy rule that targets a budget surplus. (This rule and its consequence on how to set fiscal prudence will be examined in details in Section 2). The *planned* surplus is set at a specific "prudence" level at the time of the budget. This means that the budgetary revenues are projected to be above total program spending (including public debt charges) by a specified amount referred to as a fiscal prudence. If economic growth turns out to be as expected during the fiscal year, the

realised surplus will be equal to the level of prudence and all of it will be affected to debt reduction (*i.e.*, all *ex post* budgetary surpluses are applied to the debt).[1]

If economic growth turns out to be weaker than anticipated, the budgetary revenue will fall below, and program spending will increase above, their respective projections, due to automatic stabilisation. This will not, however, necessarily lead to a deficit outcome thanks to the level of fiscal prudence introduced at the time of the budget as a wedge between revenues and spending. Thus, fiscal prudence may be viewed as a buffer that, to a certain limit, can prevent the fiscal authority from having to post a deficit outcome. Given the persistence of shocks, and in absence of a policy rule, the fiscal authority would, at the next budget, re-value the planned surplus for the upcoming years downwards. With a policy rule that targets a surplus, however, the fiscal authority would adjust its projection for program spending to avoid deviations from the target. The rule in this context calls for a decrease in program spending in the next budget. This ensures that the planned surplus is set equal to its target *every year*.[2] We have analysed, here, the case of a fiscal policy response to a negative shock. A symmetric adjustment would operate if economic growth turned out to be stronger than expected.

The budget surplus rule examined above and the debt rules considered in Box 1 share the characteristic that program spending adjust *temporarily* (and pro-cyclically) when responding to deviations from the specified target.[3] This may be viewed as "one-off" or transitory (discretionary) expenditures or cuts. But is there any limit to the scope for reducing program spending? In other words, is there any *level* of total program spending that is guaranteed or pre-committed, and hence may be viewed as permanent, in any year of the planning horizon? The third aspect of fiscal planning mentioned in Table 1 (fourth column) addresses this issue, which will be examined in further detail in Section 3 of the paper.

Georges, Hostland and Matier, and Boothe and Reid allow for unlimited scope to reduce program spending when deviations from target require an adjustment. This entails a lack of any explicit multi-year pre-commitment to permanent program spending, leading to the idea that surplus (or debt) targeting is a strategy that is followed at all cost, come hell or high water.

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[1] As explained later on in Subsection 2.1, the assumption here is that fiscal prudence is exclusively made up of a contingency reserve as defined by federal documents, and does not include economic prudence.

[2] Boothe and Reid also examine less restrictive rules that ensure that the planned surplus reverts to its target every two or four years (for example, over the business cycle). These less restrictive rules smooth the adjustments of program spending (*i.e.* they reduce the volatility of the "instrument").

[3] Our model also incorporates automatic stabilizers: *counter-cyclical* changes in program spending such that the overall fiscal stance is counter-cyclical.

Box 1. Debt-to-GDP targeting

In this box, we describe the two papers in Table 1 [(Georges (2001) and Hostland and Matier (2001)] that focus more particularly on debt targeting.

In Hostland and Matier the fiscal authority aims to bring the debt-to-GDP ratio back on track when it deviates from a (multi-year) downward-sloping debt-to-GDP target range. In Georges, the fiscal authority aims to bring the debt-to-GDP back on track when it is above a downward-sloping ceiling, but, when it falls below, it redefines a new "lower" ceiling. This leads to a sequence of *interim* ceilings.

These two studies consider alternative fiscal policy rules (column three in Table 1) that would be useful to the fiscal authority to achieve their fiscal goal (the debt-to-GDP targets).

Hostland and Matier propose a symmetric debt (or stock) rule that calls for an increase/decrease in program spending in the new fiscal year when the previous year's realised debt-to-GDP ratio falls below/above its target. The rule thus ensures that the debt-to-GDP ratio reverts to its target over the medium-term, keeping the debt-to-GDP ratio on a "clear downward" profile. They also consider a budget surplus (flow) rule whereby the budget net of prudence is balanced every year. Relative to the debt rule, the flow rule, by responding exclusively to deviations from a desired *surplus* has no mechanism to bring the debt-to-GDP ratio back to its target. Because minimizing the deviations from a *debt* target is the main goal of the fiscal authority in their paper, they conclude that a flow rule provides less scope for debt control than a debt rule.

Georges considers an asymmetric debt rule that calls for a decrease in program spending when the realised debt-to-GDP ratio is above a specified ceiling, but avoids increasing program spending when economic growth pushes the debt-to-GDP ratio below that ceiling. Instead, the fiscal authority eliminates the deviation from the ceiling by redefining a new interim ceiling path whose starting point coincides with the observed debt-to-GDP ratio. Hence, the paper models an opportunistic approach to debt reduction that, unlike Hostland and Matier, avoids *deliberate* increases in the debt-to-GDP ratio.

Our study innovates in this regard by constraining the scope for reducing program spending with a multi-year pre-commitment to a minimum level (a "floor") of program spending that is "irreversible" for the purposes of medium-term fiscal planning. The pre-commitment would include a share of the transfers to persons (largely through GIS/OAS) and other levels of government (the CHST and Equalization).[4] A preference for a stable source of funding is one obvious motivation for making those programs "irreversible".

The difference between total program spending and the permanent component can be considered as the "discretionary" or "transitory" component – programs on which the fiscal authority can backtrack, "one-off" expenditures like funds not renewed from one year to the next, all discretionary fiscal measures that do not have a permanent characteristic. The magnitude of the scope for reducing program spending effectively decomposes total program spending into permanent and transitory components. By introducing a permanent component, our study models the idea that the surplus target rule (or policy response to shocks) is not a strategy that is followed at all cost such as by rolling back new health-care transfers to the provinces or deferring pre-committed tax cuts.

In Hermanutz and Matier, the fiscal authority does not adopt a policy rule that adjusts program spending in a temporary way.[5] The scope for reducing program spending is therefore effectively equal to zero. However, they envisage rules that implement *permanent* (non discretionary) fiscal measures. This is the fourth criterion, as given in Column 5 of Table 1. They consider two different rules. The first commits the fiscal authority to a "once and for all" pre-committed five-year path of permanent fiscal measures equal to the planned surplus (net of prudence), regardless of future economic or fiscal conditions. The second rule allocates the planned surplus (net of prudence) to permanent fiscal measures, conditional on economic and fiscal conditions as the time horizon unfolds. In their model all fiscal measures are permanent, eliminating the very perspective of transitory fiscal developments as mentioned above.

Like Hermanutz and Matier, we consider fiscal policy rules that implement permanent fiscal measures. In particular, we develop rules that enrich the multi-year pre-commitment for permanent program spending and tax. The enrichment may be "once and for all" at the start of the planning horizon, or gradual and conditional on economic conditions. We show in Subsection 3.3 that the timing and magnitude of the enrichments should be linked to the occurrence of favourable permanent fiscal developments that raise the scope for making discretionary changes. This strategy would enhance the fiscal authority's pre-commitment to permanent measures without increasing the risk of a deficit outcome.

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[4] "GIS" stands for Guaranteed Income Supplement; "OAS" stands for Old Age Security; and "CHST" stands for Canadian Health and Social Transfer.

[5] Hermanutz and Matier avoid rules that adjust transitory spending because of their "large, unrealistic year-over-year *changes* in program spending". Setting a minimum floor for program spending as we do in our paper does not adequately address this issue because it focuses on the *level*, not the *variance* of program spending. We could, however, easily address this issue in our framework by constraining the yearly changes in program spending to a maximum amount.

By addressing both permanent and transitory fiscal developments we believe that our model is more realistic, and well suited to examine a large range of issues in medium-term fiscal planning and to propose new elements of a strategy for deficit risk management. Each of the four criteria discussed with reference to Table 1 will now be re-examined in further detail in the perspective of our own study, in Sections 2 and 3. Each section brings some qualifications to a strategy for deficit risk management. Section 2 shows our simulations results in the "unconstrained" version of the model, that is, without multi-year pre-commitment to a minimum level of program spending, whereas Section 3 introduces the constrained version of the model and shows the impact that a pre-commitment can have on medium-term fiscal planning.

2. The unconstrained model

This section highlights the interaction between fiscal prudence, fiscal policy rules (or policy responses to shocks) and the probability of deficit in the context of an unlimited scope to reduce program spending. There is no multi-year pre-commitment to a minimum level of program spending.

2.1 Prudence as insurance against deficits

The objective of this subsection is to illustrate the role of fiscal prudence as an insurance policy against deficits. Fiscal prudence, as defined in federal budget documents, includes a contingency reserve and an extra degree of economic prudence. Prudence can be thought of simply as an unallocated expenditure in fiscal projections. In our model, we do the simplifying assumption that fiscal prudence is exclusively made up of a contingency reserve as defined by the federal documents and does not include economic prudence. As such, if it is not used to cover unexpected changes in program spending or tax revenue, it contributes to the government's annual surplus, and in turn, to reducing net public debt.

Our analysis is conducted with reference to a ten-year plan for program spending shown in Figure 1 as the "planned" (or "control") profile for program spending. Total federal program spending (transfers and direct program spending) is projected to grow in average at the same rate as nominal GDP, about 4.5% on average. This reflects an inflation rate of 2% and a real GDP growth of 2.5% on average over the 10-year projection period.

Two assumptions in our model are explicit in Figure 1. First, the fiscal surplus for planning purposes (expected surplus net of prudence) has been set equal to zero. Second, the amount of prudence allocated remains *constant* in nominal terms during the ten-year horizon, (set at $4 billion in Figure 1). These two assumptions deserve an explanation.

The first assumption entails setting the planned tax revenue profile above the planned program spending profile (including debt service) by the specified amount of prudence. Box 2 examines the first assumption in further detail and the potential criticisms that it may raise. Our main findings do not depend on the control profiles themselves, although empirical estimates of say, the probability of a deficit, do.

Box 2. Control profiles for program spending and tax

The first assumption entails setting the planned tax revenue profile above the planned program spending profile (including debt service) by the specified amount of prudence. In doing this, the fiscal authority exhausts the expected surplus net of prudence [or "fiscal surplus for planning purposes" as commonly referred in economic and fiscal ("Fall") update documents]. The budget balance and the yearly debt reduction are therefore planned to be equal to the amount of prudence, which will be reflected in the profile of planned debt service. The planned profile for program spending is projected to grow in average at the same rate as nominal GDP, about 4.5% on average. This is roughly consistent with projections over the next fifty years as commonly given by population ageing models.

This methodology may lead to two potential criticisms. First, the probability of a deficit is not invariant to the allocation of the expected primary balance (net of prudence) to either program spending or tax revenues. For example, the control version of our model could be built up "upside down", starting with a given path for tax revenues reflecting all pre-announced tax measures. This would residually entail a planned path for program spending. Our simulation results with alternative control versions of the stochastic model demonstrate that the explanatory power, on the probability of deficit, of the allocation of the primary balance between program spending and tax revenues is small relative to other factors such as prudence and scope for reducing program spending.

A second potential criticism is that the control version of our model exhausts, *ex ante*, the fiscal surplus for planning purposes over the entire fiscal horizon. A possible interpretation is to think of our control scenario as inclusive of fiscal measures (program spending increases and tax cuts) that would correspond to the entire fiscal surplus for planning purposes projected in Fall Update documents. In doing so, there is a risk of overestimating the "true" probability of a deficit if it turns out that the government does not introduce fiscal measures at the start of the planning horizon, thus leaving some room on top of the fiscal prudence.[1]

These two criticisms set the limits of our paper. We do not attempt to provide an exact (unbiased) estimate of the "true" probability of deficit. Instead, the paper demonstrates that fiscal prudence and scope for reducing program spending are two factors that influence the probability of deficit, and that they can be used jointly to manage the risk of deficit.

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1. Indeed, Hermanutz and Matier show that the probability of a deficit may be significantly reduced by not committing the fiscal authority to a pre-determined path of fiscal measures that exhausts the fiscal surplus for planning purposes over the entire fiscal planning horizon. To generate their results they benchmark the control version (tax and program spending paths) of their stochastic model to the fiscal projections given in the Fall Update *before* the introduction of fiscal measures. Their method is fully consistent with their objective that pertains to the most appropriate timing of the introduction of permanent fiscal measures in order to deal with the projected multi-year fiscal surplus for planning purposes.

The second assumption in our model, made explicit in Figure 1, is that the amount of allocated fiscal prudence remains constant (in nominal terms) over the ten-year horizon. In particular, in Figure 1, it has been set such that tax revenue less total expenditure (program spending plus debt services) remain constant at $4 billion over the entire planning horizon. Setting prudence at $8 ($0) billion would shift the tax profile upwards (downwards) in Figure 1, such that the distance between planned profiles for tax revenues and program spending (including debt service) would be equal to $8 ($0) billion. Subsection 2.2 explains the reason why we can maintain the fiscal prudence constant over the entire planning horizon while Hermanutz and Matier, in their model, have to increase it.

Our analysis is based on the methodology of repeated stochastic simulations of the same planning horizon. Our stochastic model is constructed such that half of the generated observations will fall above, and half will fall below, the planned (control) profiles in Figure 1. Consequently, the profiles for program spending and taxes will be realised on *average* over a large number of simulations. Hence, the realised surplus will be equal on average to the amount of prudence (the planned surplus), and thus, the public net debt will be lowered year after year on average by the amount of prudence.

Stochastic simulation models go beyond providing point estimates (or averages) of relevant variables by capturing the uncertainty inherent in the economy.[6] This permits the construction of confidence intervals, or a range of possible outcomes along with corresponding probabilities. Figures 2 to 5 illustrate 90% confidence intervals over a ten-year horizon for the budget balances, net debt, debt services, and debt-to-GDP ratios, according to three (constant) levels of prudence ($8, $4 and $0 billion). The fiscal authority is assumed to follow a policy rule or policy response to shocks of the form of a (symmetric) surplus rule with an unlimited scope to adjust (increase/reduce) program spending. The impact of this rule on a strategy for deficit-risk management will be examined in detail in Subsection 2.2. Our objective, here, is to demonstrate that the medium-term benefits of fiscal prudence stem mostly from the insurance value it provides against a deficit.

In Figure 2, the mid-point (not drawn) of the relevant confidence interval for the realised budget balances corresponds to the level of prudence, and thus a greater prudence shifts the confidence interval up. Two other conclusions can be drawn from Figure 2. The first is that the level of prudence *per se* has no impact on the width of the confidence interval. Second, for a constant level of prudence (in nominal terms), the volatility of the budget balance slightly increases through time, therefore increasing the probability of having a balance less than zero. This means that the probability of a deficit will also increase slightly over the ten-year horizon, as illustrated in Figure 6. By construction, our model

[6] The stochastic simulation procedure in the SSM operates as follows. A total of 16 shocks displace all the endogenous variables in the model each period. Mutually independent shocks are drawn from a zero-mean normal distribution with variances calibrated to be roughly consistent with the historical data. The basic calibration procedure is explained in Hostland (2001) and changes to the procedure are reported in Georges and Moreau (forthcoming). The stochastic simulation process runs for 40 consecutive quarters (10 years) and is repeated 500 times.

entails a probability of deficit of 50% when prudence is set equal to zero.[7] A higher level of prudence reduces the probability of a deficit. On average, over a ten-year horizon, our model shows that increasing the prudence to $4 ($8) billion would lower the probability of a deficit to 15% (3%).

Figure 7 provides an alternative way to depict the sensitivity of the probability of a deficit to particular levels of fiscal prudence. It illustrates the probability distributions in year 2006 of the budget balances according to three levels of prudence. The area of the appropriate probability distribution to the left of the vertical axis (where the surplus is equal to zero) represents the probability of a deficit (in year 2006). Hence, the greater the prudence, the smaller the area under the curve and the lower the probability of a deficit.

Thus, in the unconstrained version of the model, fiscal prudence of $4 billion provides a "reasonable" amount of insurance against a deficit (probability of a deficit below 20% on average over a 10-year period). The Boothe and Reid results implied higher degrees of prudence (to achieve the same probability of a deficit). However, their model structure and calibration likely overstate the amount of uncertainty that the government faces, and thus the amount of prudence required. The Hermanutz and Matier results also implied larger prudence. As analysed in Subsection 2.2, this is partly due to the absence of a policy response to shocks (fiscal rule) in their paper (as shown in the third column of Table 1).

Of course, besides lowering the probability of a deficit, another consequence of prudence is that, by generating budget surpluses on average, it speeds the reduction of the debt-to-GDP ratio. Figures 3, 4, and 5 illustrate the impact of the level of prudence on the public debt, debt services, and debt-to-GDP ratios. Figure 3 shows that a prudence factor of $0 billion would keep the mid-point (not drawn) of the 90% confidence interval at about $541 billion, preventing, on average, any debt reduction over the ten-year horizon. Prudence of $4 ($8) billion would permit, on average, a reduction of the debt by $40 ($80) billion in a 10-year horizon. Figures 4 and 5 show that setting a higher level of prudence shifts the 90% confidence interval for the debt services and the debt-to-GDP ratios; by 2011, this amounts to about $2 billion and 2 percentage points respectively, for each additional $4 billion of prudence. Thus, as also noted by Boothe and Reid, it appears that the medium term benefits of fiscal prudence stem mostly from the insurance value it provides against deficit, and not from the greater reduction in debt service costs.

Fiscal prudence also entails costs in terms of foregone program spending or higher than needed taxation. This cost is the present value of the area comprised between the tax revenue and program spending (including debt services) profiles in Figure 1. It may be (loosely) understood as the premium that must be paid for being insured against a deficit outcome. A higher level of fiscal prudence increases this cost.[8]

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[7] In this case, the planned profiles for tax and program spending (including interest payments) will overlap in Figure 1, generating a profile for the budget surplus set equal to zero, with half of the simulated observations above and half below it.

[8] This cost in terms of foregone program spending may be considered, as Robson and Scarth (1999) do, as a short-term pain or "bad-news" budget. The higher the prudence, the larger this cost, but the greater the

This subsection has identified fiscal prudence as one element of a strategy for deficit risk management. Subsection 2.2 identifies a second element – a policy response to shocks.

2.2 Policy response to shocks as insurance against a deficit

A striking point in our analysis is that, for a constant level of prudence, the probability of deficit as illustrated in Figure 6 only slightly increases over the ten-year horizon in contrast to the results obtained by Hermanutz and Matier (2000). For example, their analysis suggests that prudence must be increased from $3.3 billion in the first year to $20.3 billion in the fifth year of the time horizon in order to maintain the probability of deficit constant at 10%, whereas our model claims that the probability of deficit can be kept below 10% on a 10-year horizon with a prudence set constant at $8 billion. One factor that explains this difference is that, unlike their analysis, we assume a fiscal planning framework where the fiscal authority responds to shocks with temporary adjustments in program spending.

In order to demonstrate this point, we compare two fiscal planning frameworks (see Table 2), Scenario 1 that endows the fiscal authority with the ability to respond to shocks, and Scenario 2 that excludes such a response. The first scenario is the one underlying the analysis in Subsection 2.1 (for a fiscal prudence set at $4 billion). It examines a policy response to shocks of the form of a (symmetric) surplus rule that allows for an unlimited scope to adjust (increase/reduce) program spending. The rule itself was described in Section 1 (see the discussion surrounding Table 1, Column 3). For example, if last year's economic growth turned out to be weaker than anticipated, leading say, to a realised deficit, the persistence of shocks would force the fiscal authority to readjust the program spending plans downwards in this year's budget to the level required to maintain the planned surplus to $4 billion.[9] Scenario 2, on the other hand, excludes all policy response to shocks, therefore preventing any adjustments in program spending (both upwards and downwards) and setting *de facto* the scope to adjust program spending equal to zero.

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pace of debt reduction. In their model that includes a long-term debt-to-GDP target, the larger the short-term pain and the faster the appearance of larger "good-news" budgets that allow primary balances to be in deficit, suggesting that there is room for lower taxes or higher spending. Hence, the pace of debt reduction affects the intertemporal allocations of spending and taxes. Our model does not address this intertemporal issue because we do not impose a long-term target for the debt-to-GDP ratio.

[9] Setting the *unconditional* expectation of the surplus equal to the amount of prudence, say 4 billion over the ten-year horizon (as illustrated in Figure 1), permits us to generate unconditional (or control) paths for spending and tax revenues, whereas setting the *conditional* expectation of the surplus to a target of $4 billion implies a policy response to shocks such that the program spending profile (the assumed discretionary variable in our model) has to adjust. The targeted surplus must be equal to the amount of prudence for full consistency with the control version of the model.

Table 2. Alternative scenarios for the fiscal planning framework

Criteria / Scenarios		Policy response to shock (or fiscal policy rule) implementing temporary fiscal measures	Magnitude of scope to adjust program spending	Pre-commitment to permanent fiscal measures
Subsections 2.1 and 2.2	Scenario 1	Surplus rule (symmetric)	Unlimited scope	None
Subsection 2.2	Scenario 2	None	Zero scope (*de facto / ex post*)	Yes (*de facto*)
Subsection 3.1	Scenario 3	Surplus rule (asymmetric)	Limited scope (*ex ante*)	Yes

Figures 8 to 10 compare the two scenarios and highlight their implications for fiscal planning. Both scenarios have been constructed with the same planned (control) profiles for taxes and program spending described in Subsection 2.1. For example the middle line in Figure 8 is the planned profile for program spending in the two scenarios.

The first implication relates to the amount of stochastic variation in program spending (excluding the variation due to automatic stabilisation). The first scenario entails the stochastic variation illustrated by the 90% confidence interval in Figure 8. Thus, a policy response to shocks with an unlimited scope to adjust program spending may imply large reduction in program spending, abolishing existing programs and then subsequently setting up new programs. (This feature will be mitigated in Subsection 3.1 by analysing a planning framework that limits the scope to reduce program spending, as shown in the last row of Table 2.) On the other hand, the second scenario, by excluding a policy response to shocks, eliminates, *de facto*, any adjustments in program spending (zero scope) and entails a deterministic path for program spending given by the planned profile in Figure 8.[10]

The second implication relates to the amount of permanent fiscal measures that are pre-committed over the planning horizon. In the first scenario, there is no minimum level of program spending (or taxes) that is considered permanent or irreversible for fiscal planning purposes. Thus, the scope to reduce program spending is unlimited. The dual interpretation is that the unlimited scope to reduce program spending prevents any pre-commitment. The *confidence* floor represented by the lower line in Figure 8 is not a profile guaranteeing a level of permanent program spending. Indeed, the probability that

[10] As said above, we exclude the variation in program spending due to economic stabilisation.

program spending falls *below* this "floor" is 5%. In the second scenario, the fiscal authority can clearly pre-commit to a multi-year permanent level of program spending. This pre-commitment is given by the planned profile in Figure 8 (as is obvious from the first implication).

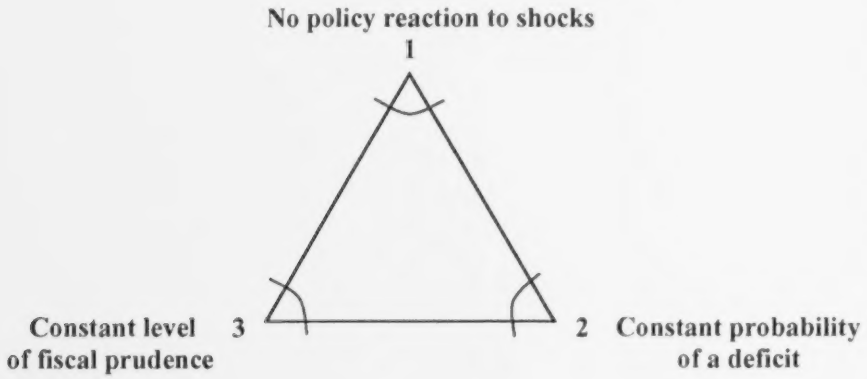
The third implication is that the lack of a policy response to shocks, in Scenario 2, generates an increasing stochastic variation of the budget balance through time, thus leading to a substantial increase in the probability of a deficit. Indeed, by not responding to deviations from a surplus target, the fiscal authority lacks a mechanism to bring the surplus back to its target in the next fiscal year. Figure 9 illustrates this by comparing the 90% confidence interval for the budget balance under both scenarios. The confidence interval, centred on $4 billion (the target for the surplus), slightly widens over the time horizon in the scenario that allows for a policy response to shock, whereas it increases substantially in the other scenario. An increased stochastic variation of the budget balance over time increases the probability of having a budget balance in deficit, as shown in Figure 10. Scenario 1 limits the increase in the probability of a deficit to about 5% points between 2002 and 2011, whereas it rises by 16% with Scenario 2.

This raises the question of how to set fiscal prudence to maintain the probability of a deficit relatively stable over the planning horizon. The fiscal prudence underlying Figures 8 to 10 was set constant at $4 billion over the fiscal planning horizon for both scenarios. This implies that giving up a policy response to shocks would require a substantial increase in fiscal prudence over the time horizon to maintain a stable probability of deficit, as is the case in the analysis of Hermanutz and Matier. Models that do not allow for a policy response to shocks are likely to *overestimate* the amount of prudence required to maintain a low probability of a deficit as the time horizon unfolds.

To reiterate, our analysis shows that 1) the absence of a policy reaction to shocks, 2) the maintenance of the probability of a deficit at a constant level over the time horizon and 3) the maintenance of prudence constant over the same time horizon, form an "inconsistent trio" as shown in Diagram 1, below. These three elements cannot coexist, and at least one has to give way. Hermanutz and Matier give up the third element by increasing fiscal prudence through time, whereas our model (Scenario 1) gives up the first element by allowing a policy reaction to shocks. Finally, Scenario 2 drops the second element by allowing a substantial increase in the probability of a deficit through time.[11] This trio of inconsistent elements should be taken into account when considering an integrated strategy for risk-deficit management.

[11] Our model (scenario 1) also suggests a slight increase in the probability of a deficit over the time horizon. This is partly due to the permanent shocks introduced in the model and to the maintenance of fiscal prudence in constant *nominal* terms rather than constant in proportion of GDP. However, we could devise a fiscal policy rule less aggressive in the early years of the fiscal planning (a two-year budget-balance rule), and more aggressive in the later years (a one-year budget-balance rule) that would maintain a constant probability of a deficit over the fiscal planning horizon, along with constant fiscal prudence.

Diagram 1. An inconsistent trio for deficit-risk management



In Section 3 we propose a framework for budget planning (Scenario 3 in Table 2) that combines the appealing features of the two scenarios analysed above, but mitigates their flaws. Unlike Scenario 1, the new framework introduces a floor or explicit pre-commitment on permanent program spending that limits the scope to reduce program spending. Unlike Scenario 2, the fiscal authority has a fiscal policy rule that permits temporary adjustments to program spending. This is a more realistic framework where there is some scope to reduce program spending and where economic shocks may lead to transitory and permanent fiscal measures.

3. The constrained model

Section 3 introduces the constrained version of the model where the fiscal authority pre-commits to a multi-year level (a "floor") of program spending that is "irreversible" or "permanent" for the purpose of medium-term fiscal planning. This section also discusses strategies for enriching the multi-year pre-commitment without substantially increasing the probability of a deficit.

3.1 Limited scope for reducing program spending and probability of a deficit

The fiscal policy rule examined in Section 2 assumes that spending decisions can be modified over time in light of fiscal developments. This may be viewed as "one-off" expenditures or cuts. Hence, they may be viewed as "temporary" (*i.e.*, "reversible", or entirely "discretionary"). There is no level of permanent program spending that is guaranteed or pre-committed in any year of the planning horizon.

There are, however, good reasons for making an explicit multi-year pre-commitment to permanent or irreversible program spending. For example, this provides a stable source

of funding for specific programs and transfers to persons (largely through OAS/GIS) and other levels of government (the CHST and Equalisation).

This subsection addresses this issue by limiting the scope for reducing program spending with a multi-year pre-commitment to a minimum level (a "floor") of program spending that can be considered "irreversible" for the purposes of medium-term fiscal planning. The floor delimits the transitory (discretionary) and permanent (non-discretionary) components of program spending.

Figure 11 illustrates the concepts of a floor on program spending and limited scope. The highest profile in Figure 11 is the planned (control) profile for program spending (as already depicted in Figures 1 and 8). The lowest profile is a binding floor on program spending referred to as Floor 1 in Figure 11.[12] As discussed in Subsection 2.2, periods of lower growth than expected will be followed by a policy response that suggests a reduction in program spending to maintain a surplus target. In the constrained version of the model, the level of program spending cannot be reduced below the specified binding floor even in those cases where an unconstrained fiscal policy rule would suggest that it should fall below it. Hence, surplus targeting is not a strategy that is followed at all cost -- come hell or high water. The floor is an explicit multi-year pre-commitment to permanent program spending (or tax cuts) with no option to backtrack. This adds an important element of realism to the fiscal planning framework studied in Section 2.

We have considered other binding floors (Floors 2 and 3 in Figure 11), resulting in several constrained versions of the model. The vertical distance between the planned profile (control) for program spending and the floors represents the magnitude of the *ex ante* (unconditional) scope for reducing program spending. For example, the area between the planned profile and Floor 1 is $60 billion between years 2001 and 2006. This means that we allow for an *accumulated* scope for discretionary measures of $60 billion between these years.[13] At the other extreme, Floor 3 is set equal to the control, allowing, *ex ante*, no scope for reducing program spending. Floor 2 is an intermediary case, allowing $35 billion of accumulated scope for transitory measures between 2001 and 2006.[14]

The model is now asymmetric because there is no upward limit to program spending (no pre-commitment to not exceed a ceiling). Thus, the simulated variables will exhibit a skewed probability distribution as is obvious in Figures 12 to 15. Figure 12 illustrates the stochastic variation of the budget balance, with 90% confidence intervals, in the various constrained versions of the model, and with the unconstrained version for reference.

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[12] Because of the binding nature of the floor in the constrained version of the model, we now say that 100% of the 500 simulated realisations are on or above the floor or that the probability for program spending to fall below the floor is set at 0%.

[13] Floor 1 in Figure 11 has been set equal to the 10% confidence floor of the unconstrained model (*i.e.*, the model with unlimited scope for reducing program spending as examined in Section 2). This way of generating Floor 1 is arbitrary. We could have based the profile for Floor 1 on more "conventional" elements as population growth and inflation for example. Our objective here is to analyse the impact of having a binding floor, not to emphasize exactly where it is or should be.

[14] Subsection 3.3 will make explicit how Floor 2 was generated.

Introducing a floor on program spending only has an impact on the 5% confidence floor (the lower bound of the confidence interval) for the budget balance. A higher floor on program spending lowers the 95% confidence floor on the balance, which increases the probability of a deficit. Figure 13 illustrates the skewed probability distributions for the budget balances in the year 2006, whereas Figure 14 illustrates the probability of a deficit over the entire planning horizon.

Imposing a multi-year pre-commitment on program spending has also consequences for debt control as shown in Figures 15 and 16 with the 95% confidence ceilings on the debt and debt–to-GDP ratio. A "higher" floor on program spending raises the confidence ceiling on the debt and debt-to-GDP ratio.

In conclusion, imposing a multi-year pre-commitment (a floor) on program spending implies that spending cannot be reduced as much as it should be for surplus targeting purposes during periods of recession. In this framework, surplus targeting is not a strategy that the fiscal authority follows at all cost by deferring pre-committed tax cuts or backtracking on commitments considered as "irreversible". The lower floor for program spending (Floor 1), by allowing a larger scope for reducing program spending, mitigates the increase in the probability of a deficit outcome over the time horizon and the loss of debt control. The upper floor (Floor 3), however, by allowing no scope for reducing program spending, entails a higher probability of a deficit outcome and raises the possibility of a loss of debt control.

3.2 Prudence, scope and probability of a deficit

The previous subsection has established a negative relation between the scope for reducing program spending and the probability of a deficit. Subsection 2.1 has established a negative relation between fiscal prudence and the probability of a deficit. These results show that the fiscal prudence and the scope for reducing program spending jointly determine the probability of a deficit outcome.

Figure 17 illustrates this conceptually using iso-probability curves. Each curves implies that one can generate a constant probability of a deficit outcome with different combinations of prudence and scope for reducing program spending. Decreasing prudence would increase the probability of a deficit. Hence, in order to generate the same probability of a deficit one could increase the scope for reducing program spending, which would require a lower pre-commitment to permanent program spending.

What can we say about the numerical trade-off between scope and prudence? Figure 18 shows the probability of a deficit for different levels of prudence (S8, S6, and S4 billion) in the case where there is no scope to reduce program spending below the control path (Floor 3 in Figure 11). A scenario with S8 billion of prudence generates a probability of a deficit of about 29% in average over the ten-year horizon. Figure 18 shows that we can roughly approximate this probability with a scenario that allows S4 billion of prudence

together with some scope to reduce program spending (Floor 2 in Figure 11). This scope ranges from 3.5% of total program spending in year 2002 to about 5% in 2011.[15]

By highlighting the trade off between prudence and scope our paper nests, as limiting cases, the assumptions of Hostland and Matier and Hermanutz and Matier in a unified framework, as shown in Figure 17. On one hand, Hermanutz and Matier assume zero scope for reducing program spending. They therefore maximize the multi-year pre-commitment for permanent program spending, but at the cost of a high level of fiscal prudence to ensure against the risk of a deficit. Hostland and Matier, on the other hand, assume an unlimited scope for reducing program spending, precluding any commitment for permanent program spending but at the same time minimizing the prudence required over the time horizon to ensure against the same risk (probability) of a deficit. More realistically, our paper explores a framework for medium-term fiscal planning that considers the range of options between these two extremes.

3.3 Enrichment to the pre-commitment for permanent fiscal measures

This subsection addresses the question (pointed out in Column 5 of Table 1) of how multi-year pre-commitments to permanent tax and spending measures can be enriched without substantially raising the probability of a deficit outcome. An adequate management of the scope for reducing program spending appears to be crucial for the implementation of a successful strategy.

We assume that the fiscal authority responds to positive shocks in the economy by allocating a share of the *increase* in spending suggested by the fiscal policy rule (examined in previous sections) to the permanent component of total program spending -- the "floor". Hence, positive economic developments lead to both transitory *and* permanent fiscal measures. This is a more realistic framework than the one analysed by Hostland and Matier, which considers transitory fiscal measures only, and the one by Hermanutz and Matier, which allows for permanent fiscal measures only.

To this end, we superimpose a conditional rule to the surplus target rule examined previously. According to this rule, each year of the fiscal horizon, the fiscal authority allows for an upgrade (enrichment) of the floor on program spending based on the economic conditions. Hence, the rule allows the fiscal authority to determine each year whether or not there will be an upgrade (a shift up of the floor) and, if there is, the rule determines the magnitude of the shift. Under this rule, once multi-year measures are announced in a particular year of the fiscal horizon, they are implemented regardless of the economic or fiscal conditions realised during future years. Measures are permanent in the sense that the new floor is permanently above the previous floor.[16] This rule is conditional in the sense that it provides for successive gradual increases in permanent fiscal measures as conditions permit.

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[15] In the first two years of the planning horizon, however, the fiscal authority would not be able to economize as much prudence. In the second year, for example, the same scope would permit to economize $2 billion of prudence only.

[16] However, the shift in the floor is not necessarily a parallel shift.

According to the rule, multi-year pre-commitments will be enriched to the extent that favourable economic developments raise the scope for making discretionary changes in program spending in the future. In more technical terms, the magnitude of the shift in the floor is assumed to satisfy an intuitive condition that the *conditional* scope for discretionary measures must not exceed the *unconditional* scope. As defined earlier, the unconditional scope is given by the vertical distance between the planned (control) path for program spending and the *initial* floor (*i.e.*, the floor before any upgrade was implemented), say, Floor 1 in Figure 11. We now define the conditional scope as the vertical distance between the program spending profile induced by the surplus target rule and the *current* floor for program spending (*i.e.*, the floor that resulted from the latest upgrade). Hence, this rule suggests that all positive shocks that set the conditional path for program spending above its current floor by a distance larger than the unconditional scope will trigger an upward shift of the floor, equal to the difference between these two scopes.[17]

Under the conditional rule it is not possible to determine *ex ante* the total amount of permanent fiscal measures that will be implemented over the fiscal planning horizon. However, *ex post*, over a large number of simulations, one can calculate the average profile taken by the conditional floor over the planning horizon.[18] Thus, we simulate the conditional rule starting with an initial floor given by Floor 1 in Figure 11, and compute *ex post* the average upgraded floor on program spending. This average profile is Floor 2 reported in Figure 11. The area between Floor 1 and Floor 2 represents the *average* amount of additional permanent fiscal measures that have been introduced. The area equals $25 billion in total over a five-year planning period (2001 to 2006).

To demonstrate the importance of managing the scope for discretionary measures when enriching pre-commitments to permanent measures, we now compare our results with a strategy that disregards the scope. According to this alternative strategy, the fiscal authority simply pre-commits in the first year of the planning horizon to $25 billion of additional permanent fiscal measures. In other words, the fiscal authority pre-commits once and for all, and at the onset of the fiscal planning horizon, to Floor 2 instead of Floor 1. Once additional multi-year measures are announced in year 2001, they are implemented regardless of the economic or fiscal conditions realised during all future years of the planning horizon. This therefore leads to a corresponding decrease in the (unconditional) transitory component of program spending (or the scope to reduce program spending).

We are interested in the impact on the probability of deficit and debt control, of the two rules described above – the (unconditional) rule whereby the fiscal authority pre-commits once and for all to a pre-determined 25 billion of additional permanent measures over the

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[17] According to the rule, it is necessary, but not sufficient, that the conditional path for program spending be above its control path to trigger a shift in the floor on program spending.

[18] Each simulation of the planning horizon provides one specific sequence of upgrades for the floor. With repeated simulations of the same planning horizon we obtain a probability distribution of the upgraded floor, from which we can compute a mean profile.

time horizon 2001 to 2006, and the conditional rule whereby the fiscal authority commits in average to $25 billion of additional permanent measures conditional on good economic/fiscal shocks.

The impact, at the same level of fiscal prudence, is reported in Figures 19 and 20 for the probability of a deficit and for the 95% confidence ceiling on public debt. In both figures, the upper line shows the results given by the "once and for all" rule. The middle line illustrates the results that we obtain with the conditional rule. Finally, for reference, the lower lines in both figures show the probability of a deficit and debt ceiling obtained in the initial situation, that is before the introduction of new permanent measures (Floor 1).

Introducing $25 billion of permanent measures with a "once and for all" rule requires comparing two constrained versions of our model, a model constrained by Floor 1, and another constraint by Floor 2. The lower and higher profiles in Figures 19 and 20 report the results. We see that the probability of deficit increases by about 10% after five years, whereas the debt ceiling increases by about 12 billion. The intuition for these results is the one given earlier in Subsection 3.1. Pre-committing to a higher floor increases the asymmetry of the model. This leads to a more skewed probability distribution, thus increasing the probability of a deficit and shifting up the 95% confidence ceiling on debt.

On the other hand, introducing 25 billion of measures on average, but in a conditional manner, entails comparing the lower and middle lines in both figures. There is only a small increase in the probability of a deficit (about 2 percentage points) and no substantial additional loss of debt control (as given by the 95% confidence ceiling on debt) over the five-year planning horizon. The smaller increase in the probability of a deficit or the amount of debt control that the fiscal authority *retains* with the conditional enrichments of the floor by *not* pre-committing *ex ante* to Floor 2 is the value of waiting for positive shocks before introducing permanent fiscal initiatives. This illustrates the importance of the "right timing" in the introduction of permanent fiscal measures.

By comparing the two revision rules at the same level of fiscal prudence, we see that the conditional rule guarantees, *on average*, the same multi-year path for permanent program spending but reduces the risk of deficit outcomes. This result is driven by the alternative methods of managing the scope for reducing spending under the two rules. The "once and for all" rule decreases the scope "once and for all" at the start of the planning horizon. The conditional rule, on the other hand, introduces permanent measures only if the *conditional* scope for reducing spending exceeds the *unconditional* scope. The timing and magnitude of the enrichments of permanent tax and spending measures should be linked to the occurrence of favourable fiscal developments that raise the scope for reducing program spending. This strategy would enhance the fiscal authority's pre-commitment to permanent measures without substantially increasing the risk of a deficit outcome.

The benefit of the conditional rule in terms of lower probability of deficit, however, comes at a cost. The conditional rule implies uncertainty surrounding the amount of

fiscal measures that can be introduced over a five-year period. The $25 billion of additional fiscal measures represents an *average* in the case of the conditional rule (with a range of variation), whereas it represents a risk-free amount in the case of the "once and for all" rule. Hence, our results confirm the conclusion of Hermanutz and Matier that there exists a fundamental trade-off between a once and for all five-year pre-commitment and a conditional rule. While there may be a lower probability of deficit and a better debt control with a conditional rule, this does come at a cost – increased uncertainty surrounding the amount of permanent measures that will be implemented.

4. Conclusion

Our paper examines medium-term fiscal planning in a realistic framework where there is some scope to reduce program spending and where economic shocks lead to transitory and permanent fiscal measures. We believe that this new framework leads to a better-grounded strategy for deficit risk management.

This paper shows that managing the risk of a budget deficit has (at least) two elements, the level of fiscal prudence, and the scope for reducing program spending. These two elements *jointly* determine the probability of a deficit outcome. The magnitude of the scope is limited by a multi-year pre-commitment to a minimum level (a "floor") of fiscal measures (program spending and taxes) that is "irreversible" or permanent for the purpose of medium-term fiscal planning.

Our paper shows that we can economize on the amount of fiscal prudence, but still insure against the same risk of deficit (*i.e.*, avoiding a deficit outcome with the same level of probability) if the fiscal authority is allowed enough scope for reducing program spending when needed. For example, we show that the fiscal authority can reduce the fiscal prudence from $8 to $4 billion each year over a ten-year period but still maintain the probability of deficit at about 29% in average over the same horizon if the fiscal authority is allowed a scope to reduce program spending of roughly 5% of total program spending. Hence, this paper shows that the fiscal authority has the ability to trade-off prudence with scope to reduce program spending.

The policy implications of the paper are twofold. First, one has to know how much scope is available for reducing program spending in order to provide estimates of "adequate" levels for fiscal prudence. There is, however, little consensus about how much scope is available. Second, the timing and magnitude of the enrichments of permanent tax and spending measures should be linked to the occurrence of favourable permanent fiscal developments that raise the scope for reducing program spending. This strategy would enhance the fiscal authority's pre-commitment to permanent measures without substantially increasing the risk of a deficit outcome.

Two qualifications will be addressed in future research. In our paper, the fiscal authority knows the transitory versus permanent components of economic shocks, which makes fiscal planning easier. Future research will analyse the impact of model uncertainty by assuming that the fiscal authority is uncertain about the permanent versus temporary

components of output. We will show that if the fiscal authority overestimates the persistence of shocks, then permanent additional fiscal measures introduced erroneously in good times cannot be undone in bad times, which increases the overall probability of a deficit.

In our paper, we do the simplifying assumption that all *ex post* surpluses are allocated to debt reduction. Future research will consider the implications of allocating surpluses in excess of the contingency reserve to higher program spending and/or lower taxes. In this framework, we will also examine the implications on the public debt and the probability of a deficit, of the October 2000 decision by the government to assess, every Fall, the economic circumstances and then to determine whether an amount of debt pay-down greater than the contingency reserve is warranted for that fiscal year.

Figure 1. Fiscal prudence and exhausted fiscal surplus for planning purposes

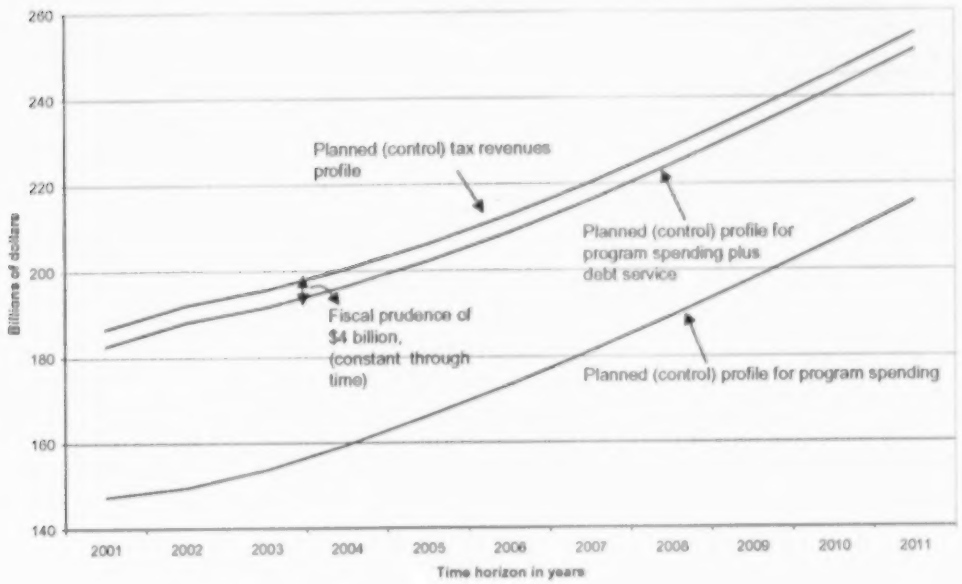


Figure 2. Fiscal prudence and confidence intervals for budget balances

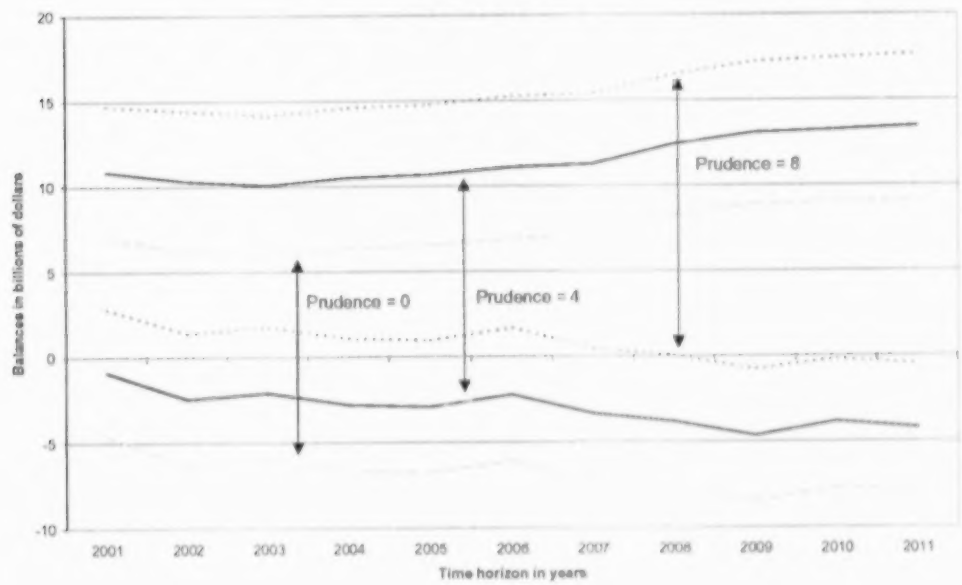


Figure 3. Fiscal prudence and 90% confidence intervals for net public debt

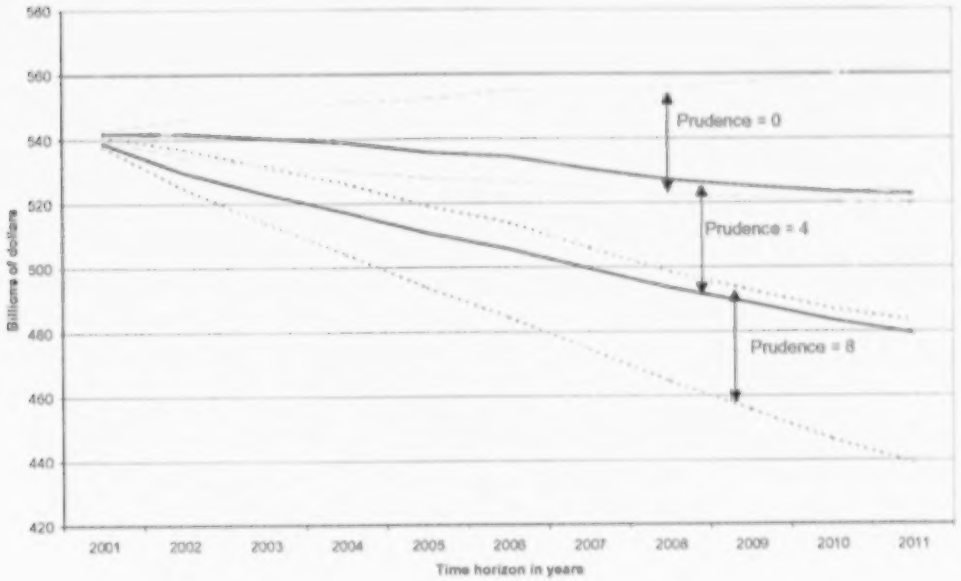


Figure 4. Fiscal prudence and 90% confidence intervals for debt service costs

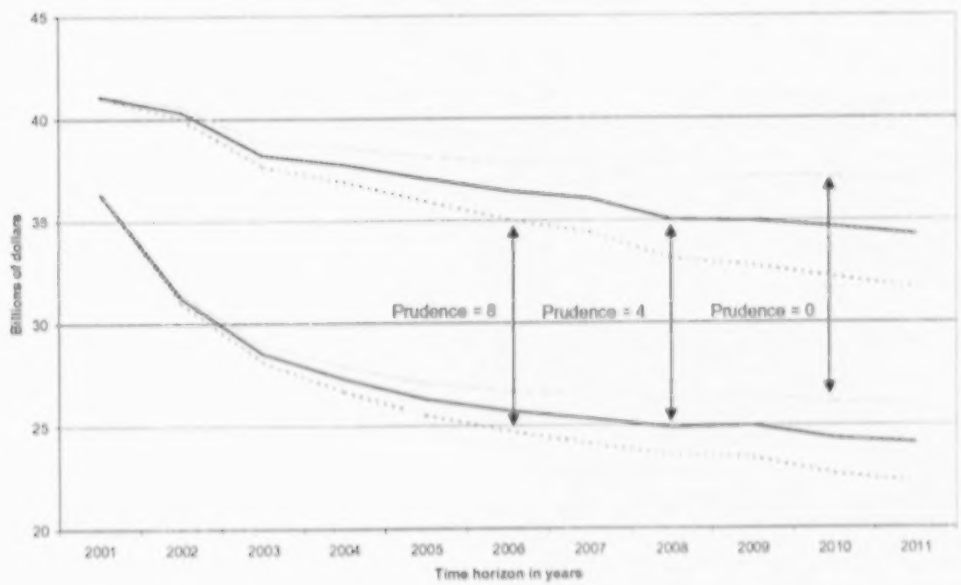


Figure 5. Fiscal prudence and 90% confidence intervals for net public debt/GDP ratio

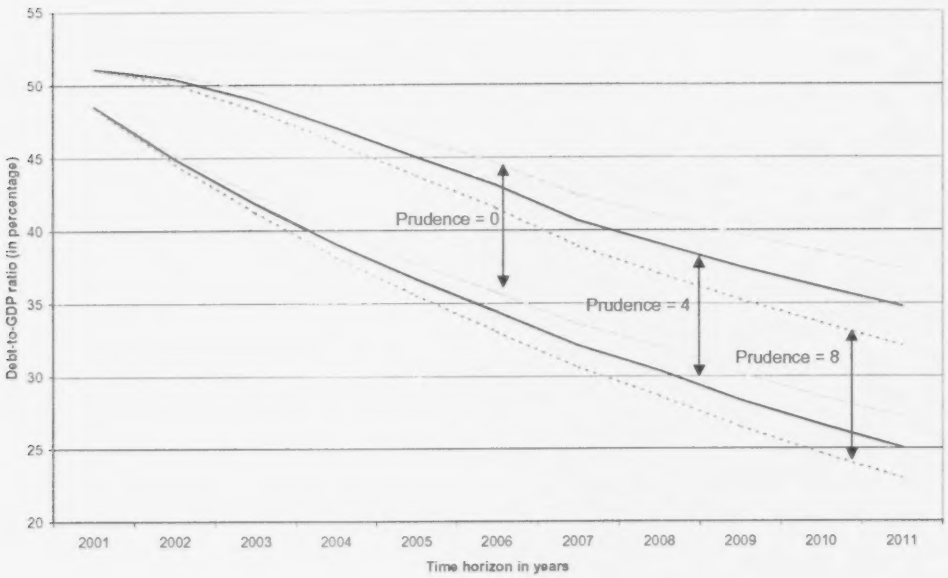


Figure 6. Fiscal prudence and probability of a deficit outcome

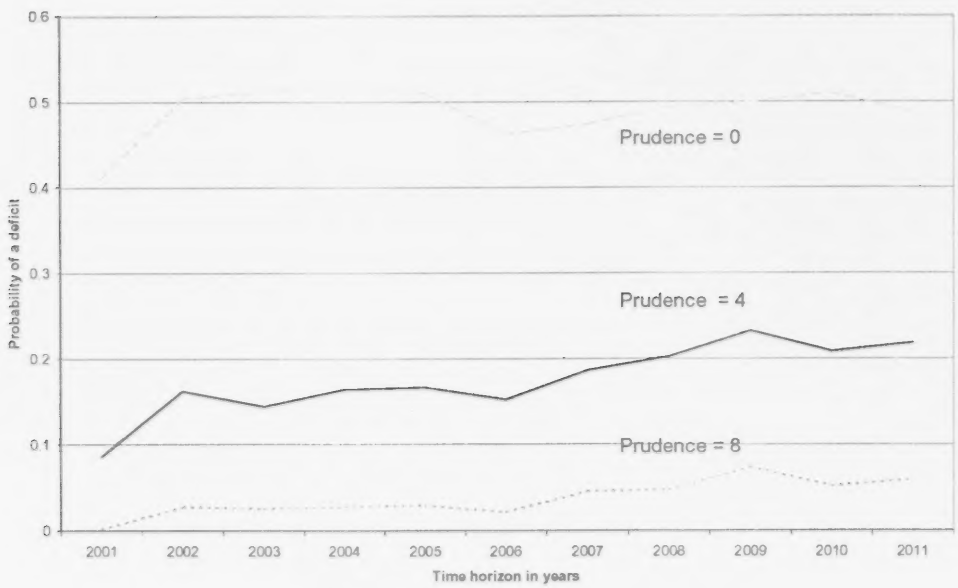


Figure 7. Fiscal prudence and probability distributions for budget balances

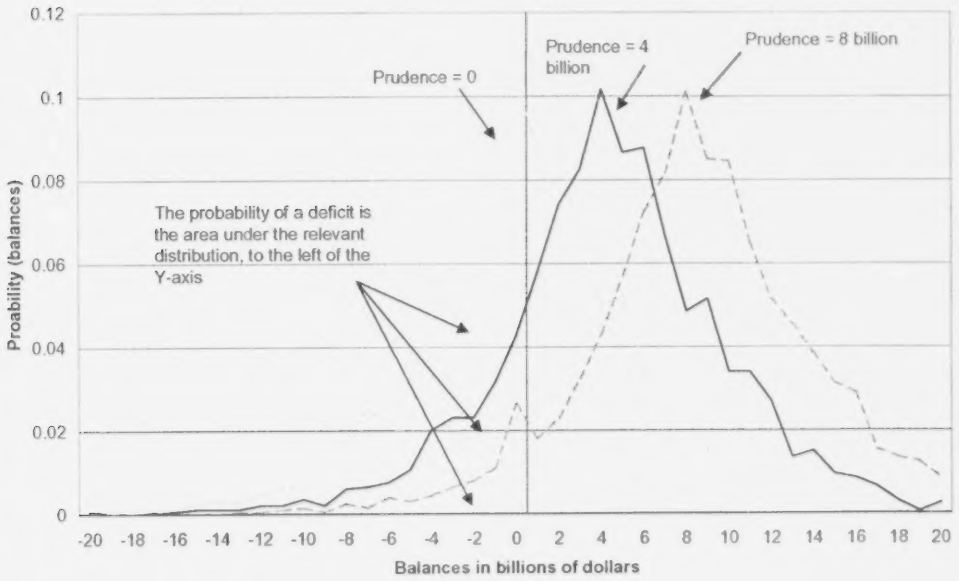

0.12
0.1
0.08
0.06
0.04
0.02
0
Proability (balances)
Prudence = 0
Prudence = 4 billion
Prudence = 8 billion
The probability of a deficit is the area under the relevant distribution, to the left of the Y-axis
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
Balances in billions of dollars

Figure 8. 90% confidence interval for program spending with and without policy response to shocks

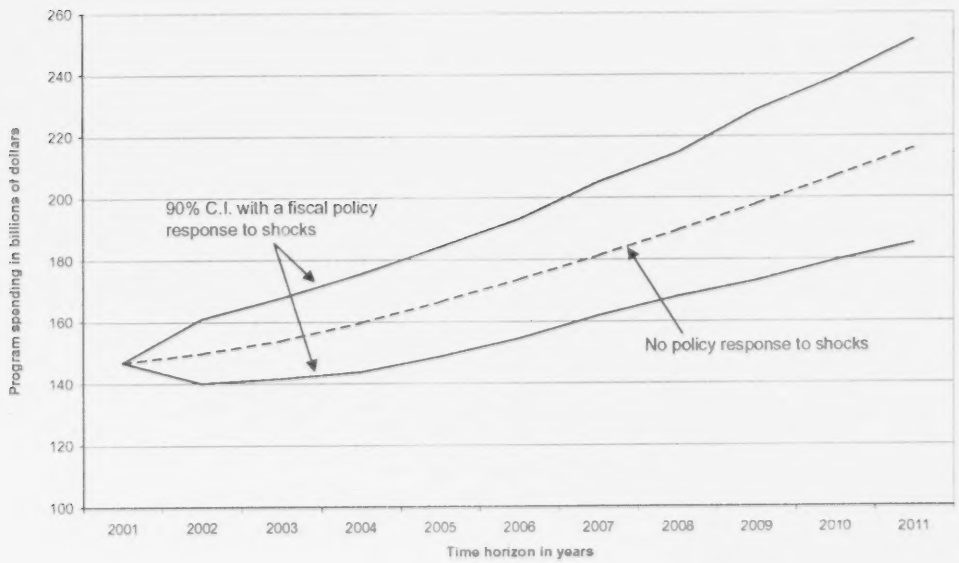


Figure 9. 90% confidence intervals for budget balance: with and without policy response to shocks

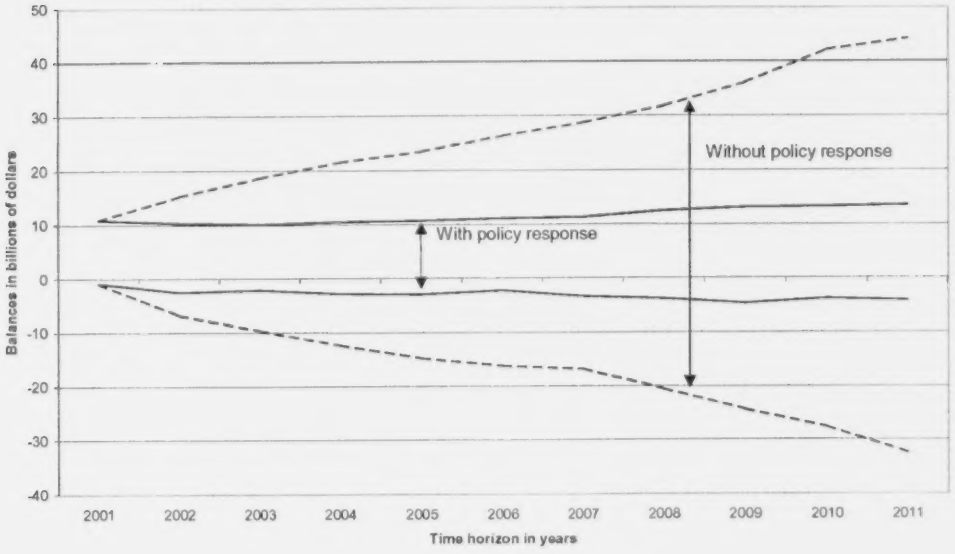


Figure 10. Probability of a deficit outcome with and without fiscal policy response to shocks

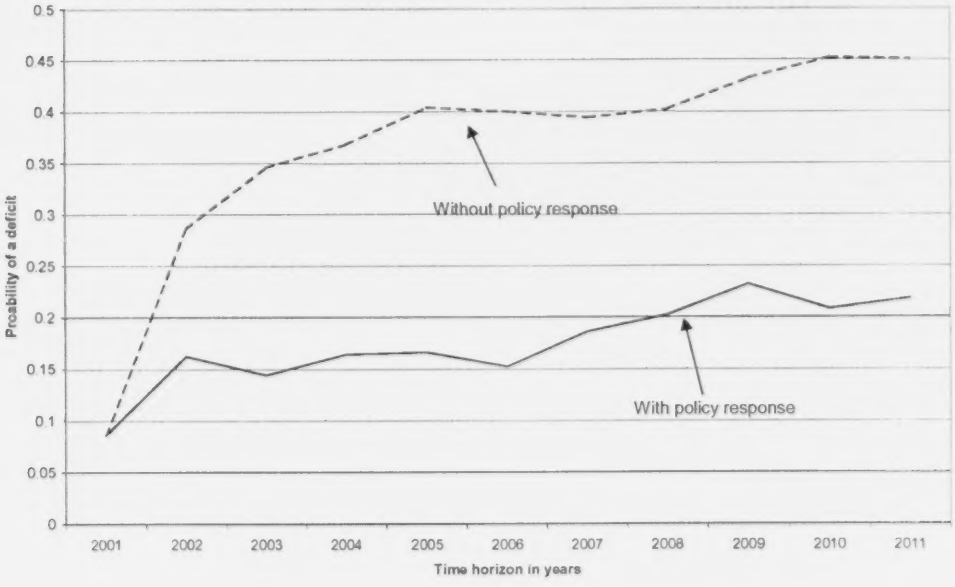


Figure 11. Scope for reducing program spending

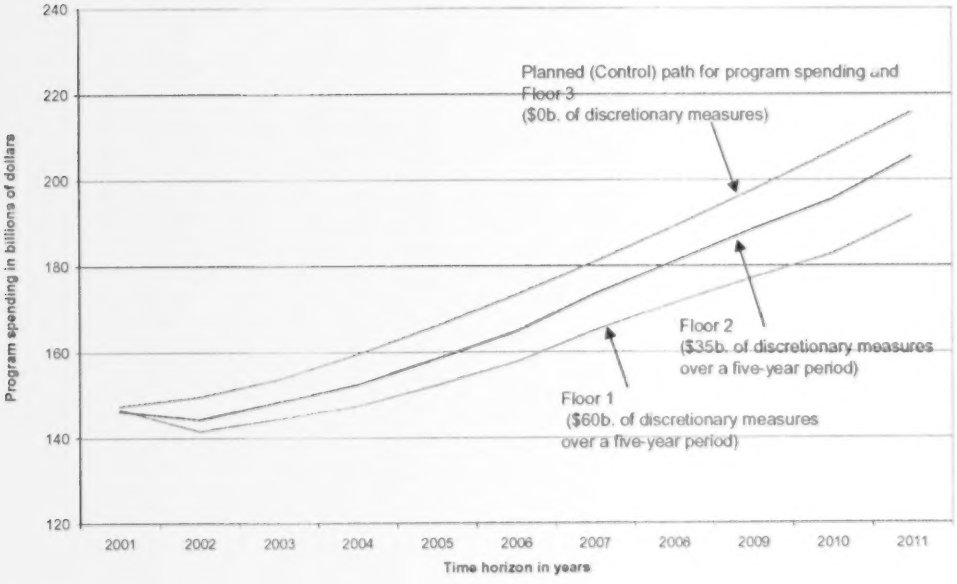


Figure 12. 5% confidence floors for budget balance: Unconstrained versus constrained models

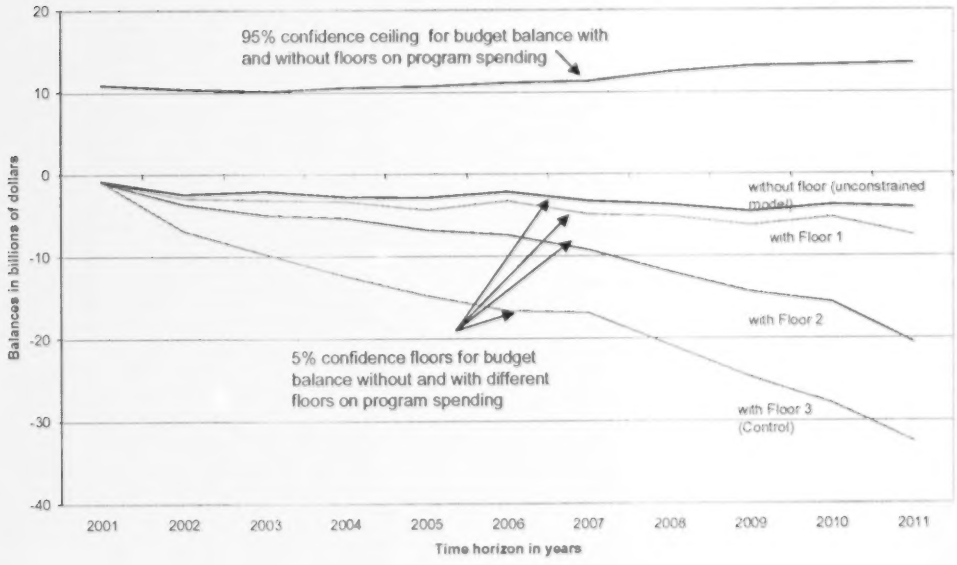


Figure 13. Probability distributions for budget balances: Unconstrained versus constrained models

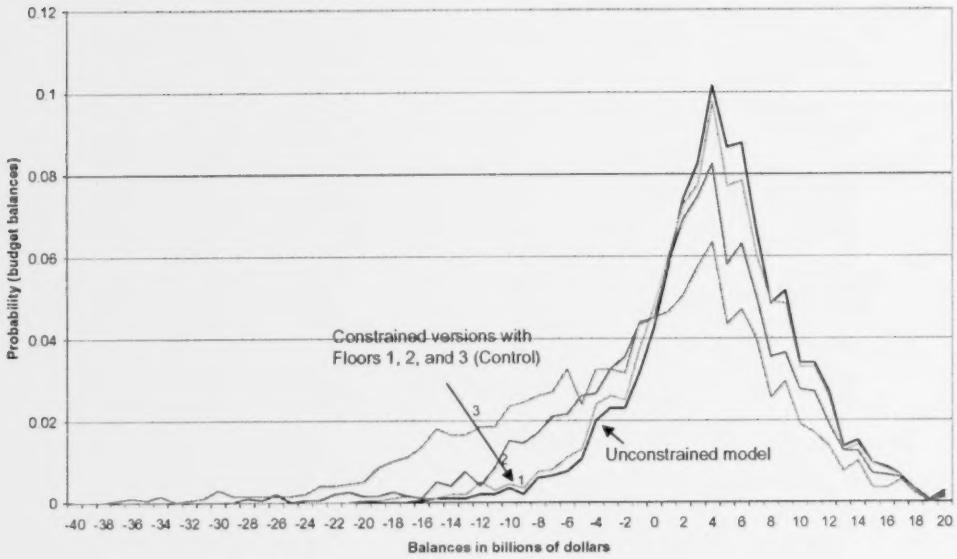


Figure 14. Probability of a deficit outcome: Unconstrained versus constrained models

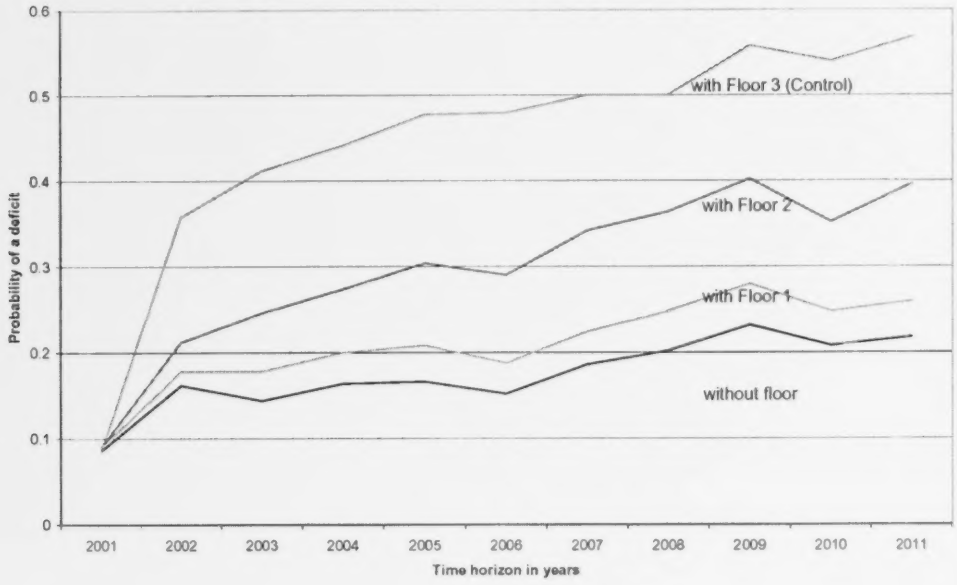


Figure 15. 90% confidence intervals for net public debt: Unconstrained versus constrained models

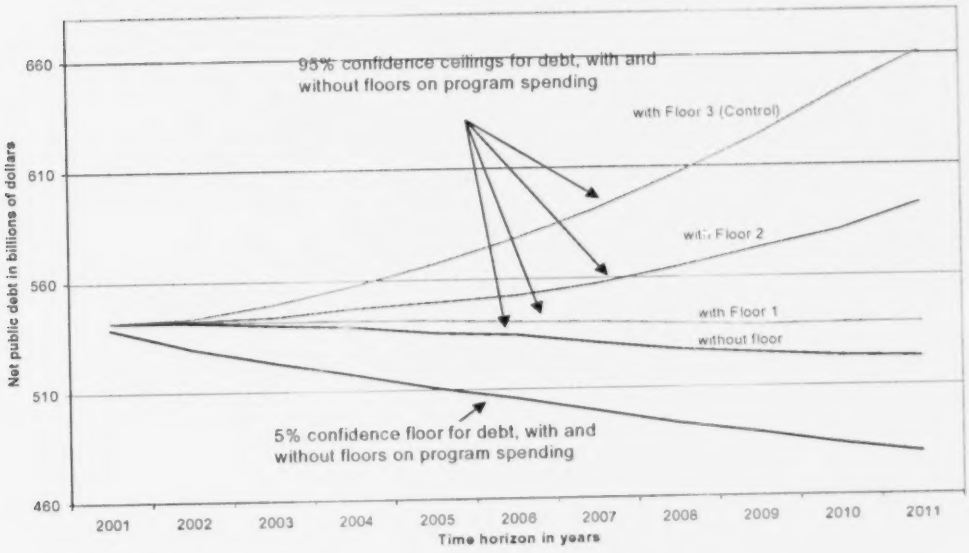


Figure 16. 90% confidence interval for debt/GDP ratio: Unconstrained versus constrained models

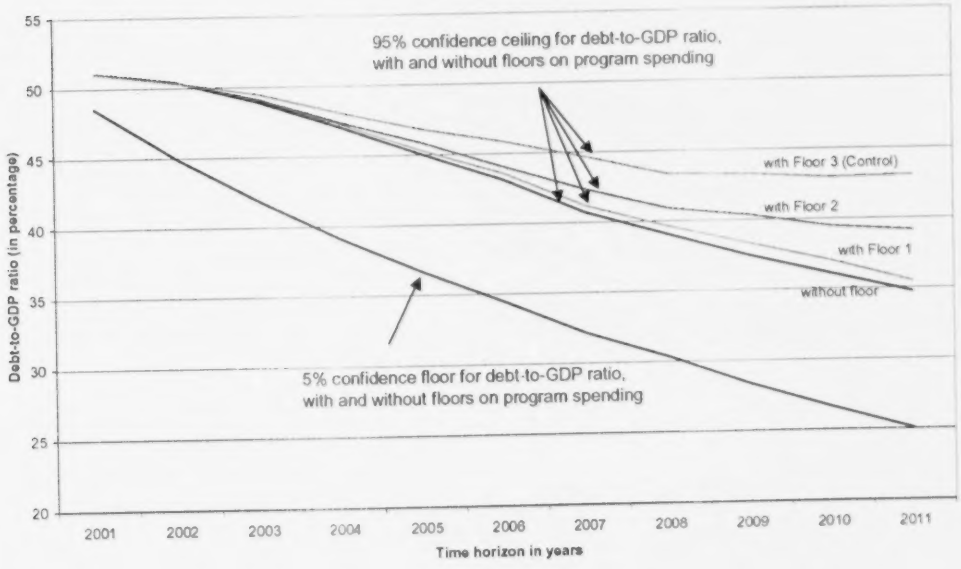


Figure 17. Prudence, scope for reducing program spending, and probability of a deficit

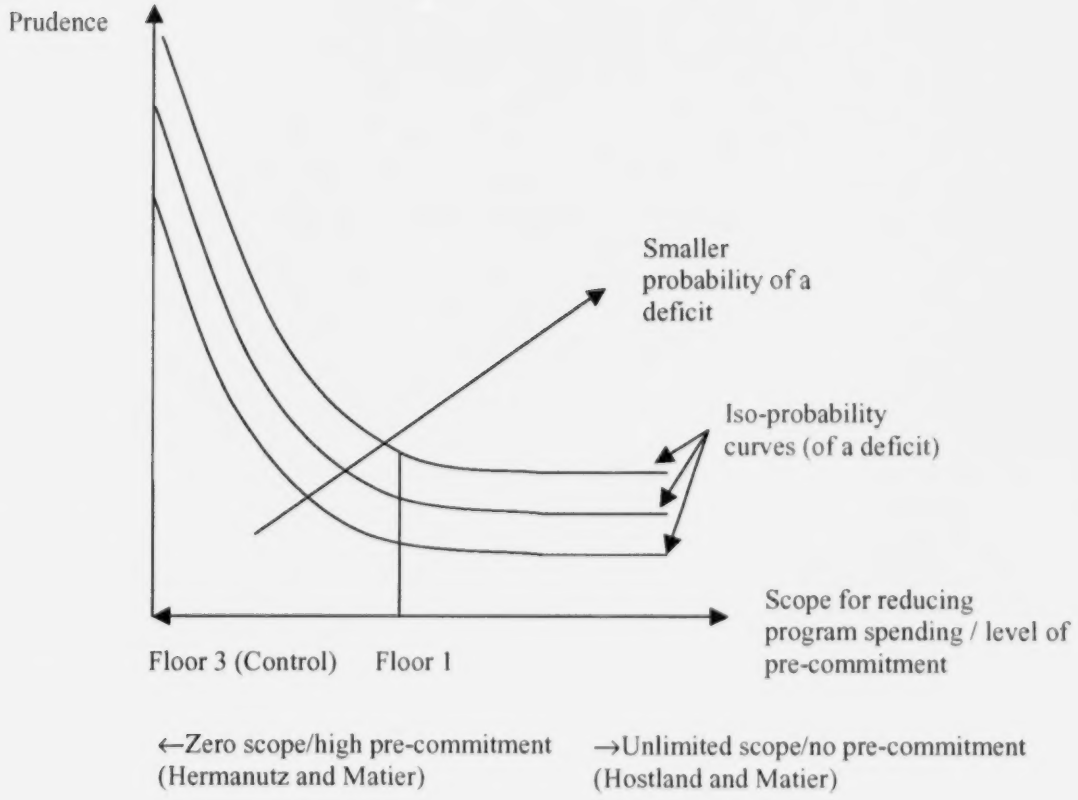

Prudence
Smaller probability of a deficit
Iso-probability curves (of a deficit)
Scope for reducing program spending / level of pre-commitment
Floor 3 (Control)
Floor 1
←Zero scope/high pre-commitment (Hermanutz and Matier)
→Unlimited scope/no pre-commitment (Hostland and Matier)

Figure 18. Trading-off prudence with scope

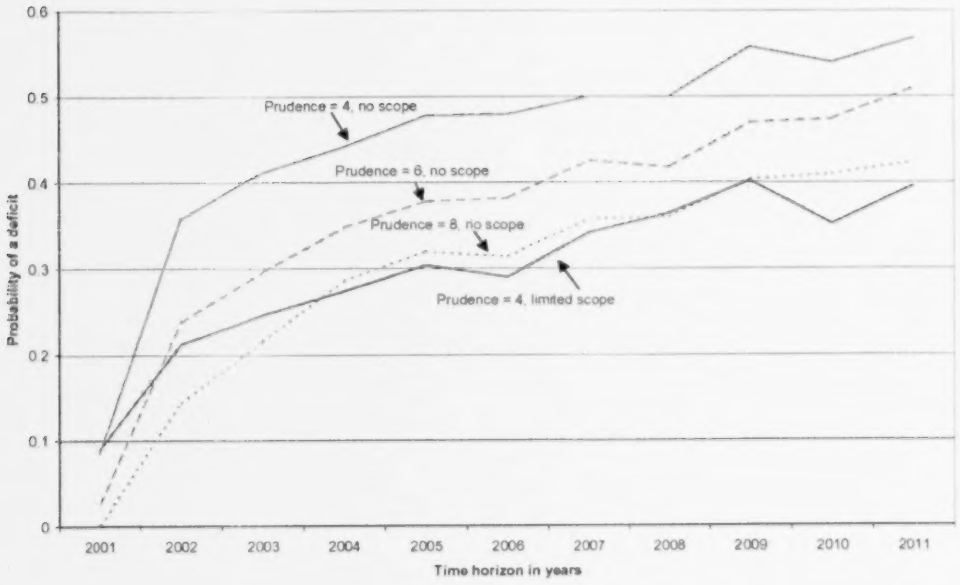


Figure 19. Probability of a deficit: The value of waiting

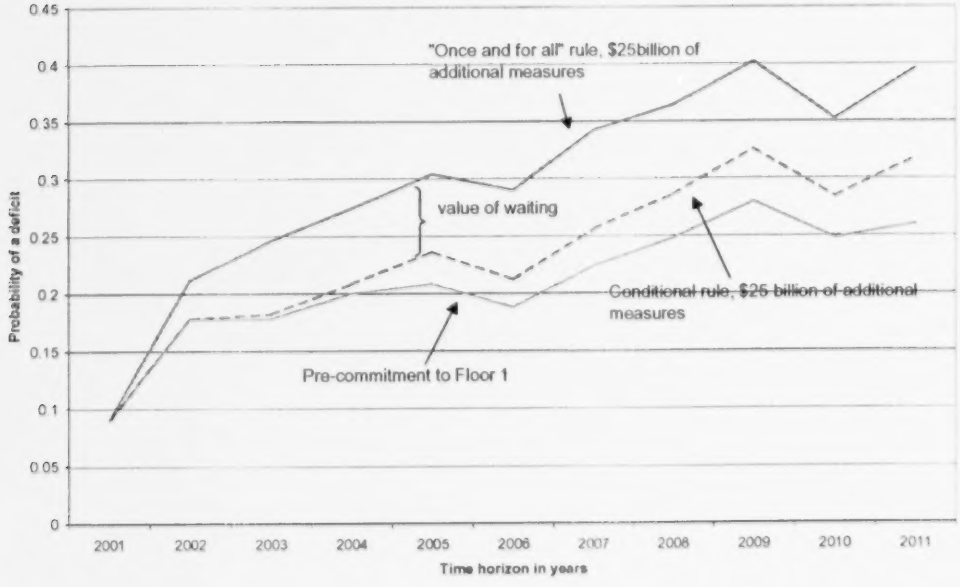
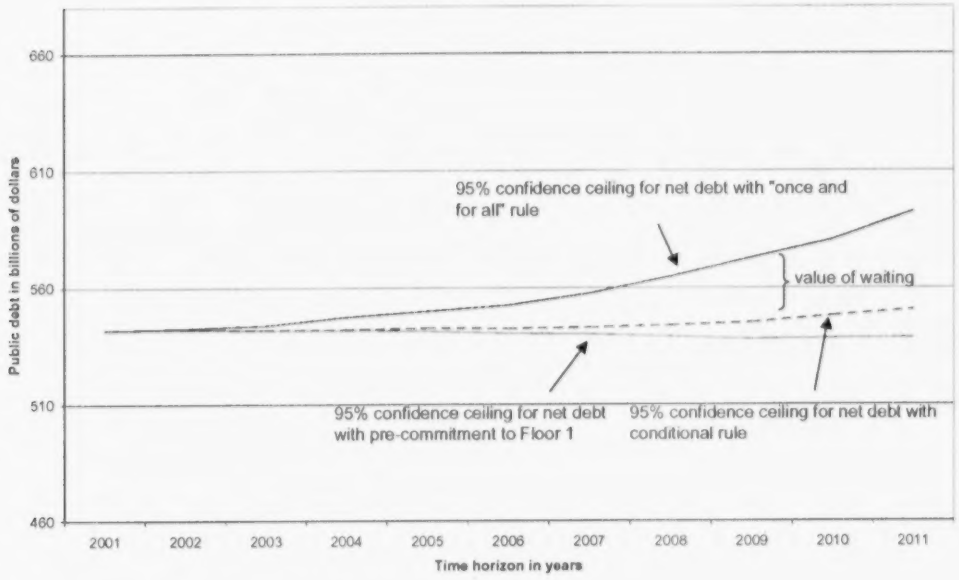


Figure 20. 95% confidence ceiling for net public debt: The value of waiting



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